

Wayne Minshall Interview

VR: Wayne, thank you for being here. I'd like to start talking to you a little about your early life and especially what influenced you to become a river ecologist?

WM: Actually, that didn't start until after I got to college. I got interested in fisheries program, a fish and wildlife program, and the person teaching it, or involved with it, was C. J. D. Brown who was a Ball and Hooper kind of a colleague and his wife had been with P. S. Welch as his secretary. In the course of going through that program, I began to think ahead about graduate school and so on and I came across a paper that one of Brownie's students had written. Gumtow had done this study on periphyton in the Gallatin River and that really captivated me. During the limnology class, he took us out to the Gallatin, we did some sampling, I did a few projects relating to streams and I think I was caught after that. Brown, through his wife, (his wife, as I said, had been a secretary for P. S. Welch; so did one of the people at the University of Louisville and they had shared the office together), so when I expressed an interest in going on to graduate school, Brown put me in contact with these people at the University of Louisville, where they were starting up this Potamological Institute for the study of rivers. I said, "That's really what I want to do". I won a National Defense title IV fellowship to go to Louisville and began a pretty concentrated career then and studied on various aspects of stream ecology. It all took off from there because I did my dissertation work on Morgan's Creek. I got involved with Minckley sort of on a tangential thing where he and Louis Krumholz were studying Doe Run. My wife was working with Louis Krumholz on a Master's degree and so forth. So I just became more and more immersed in stream ecology at that point.

VR [2:24]: Tell us a little about, in your professional career you've worked in many parts of the United States and in the world. How did that influence how you viewed streams?

WM: Well, it was a very broadening experience. First of all, I came from the West, more or less arid but forested, where I was drawn to eastern deciduous forests. I had never been across the Missouri River or the Mississippi River before, in terms of going east. So this was a whole expansion, just in my education, to be exposed to that. And then the whole sort of paradigm that you build working with deciduous forest streams, and (contemporary with some of the other eventual PIs) I was coming into the realization of the importance of the leaves that fell in the streams in terms of an energy base. I ended up doing my dissertation research on the importance (the role) of allochthonous detritus in stream systems. So that was very informative in my view of, sort of my world view, of the ecosystem. Well, then I went to England where a lot of the trees, where it would have been deciduous forest trees, but the trees had been removed, clear back to the time that wooden ships were being built. That system was kind of kept in a disclimax by the sheep. So here we are in moorlands, going through some degree of influence, but where (influence by the deciduous vegetation) but where the grasses play a much bigger role, where the water chemistry was more modified by aerial inputs, and so on. So we had sort of an acid, low ionic balance and that ultimately turned out to affect a lot the distribution of the invertebrates in the River Duddon system. So, a little bit more mind-expanding

kind of a system. And then I came West to study in Idaho and I was drawn by the Rocky Mountains, ... by that whole western revisitation of where I'd grown up, and so on. I was really intent on doing a mountain stream study and even... I began some studies on Mink Creek, which was near where Idaho State University is. Some of those continued during my career. We were approached by some people from Utah State who were starting to become involved in the International Program In The Desert Biome. I wasn't particularly interested and sort of unenthusiastically participated. But then, the person, Fred Wagner, reminded me that there might be funding available for research in desert streams and so I sort of grudgingly decided that perhaps I should devote some attention to that, in deference to studying mountain streams. As I've commented to others subsequently, I learned more in 5 to 10 years of study on a desert stream than I would by studying another 25 years on a mountain stream, just because of, again, the eye-opening nature of the activities and my realization that in many streams autotrophy rather than heterotrophy (or allochthonous input) was important. So that really gave me a very broad kind of world view when it came to participating in the discussions for the River Continuum. And a lot of those folks were coming from forested environments. I had had the experience in the forested environment, but now I had the perspective of the more-open systems and the potential role that autotrophy could have, even in the headwaters or, as we finally emerged in one of our publications, a "sliding scale" in relation to the river continuum.

VR [6:06]: Mentioning the River Continuum, how did you get involved in that in the first place?

WM: This always stops me for a minute, just to think exactly when (and maybe there were several kinds of incidents as it finally brought it about). I know that Ken in particular sees as a focus the AAAS meetings, and that surely brought us together; made me maybe friends with or acquaintances with Robin, with Ken, and with Bert. Bert and I actually struck up quite a friendship as a result of those meetings, even stronger than with the other potential PIs. But then, when we came back, I was able to involve Bert in the I.B.P. program, that was still ongoing, as a part of the extension of the cold desert, Desert Biome, sagebrush steppe sort of area. And then, through Bert and some exchanges we were doing among Oregon State, and involving Bert's lab, and involving Idaho State, and some traveling with graduate students to have interactive kinds of mediums, and so on. I gave a presentation on "autotrophy and stream dynamics" in our desert biome system, Deep Creek. And Jim Sedell was there, and I think that was the first time I met Jim. I really believe it was at that point that I, through Jim's efforts, got involved in the further River Continuum contacts. Because I had not been in loop for the Rockefeller meetings and the involvement that Robin had out of the Stroud Lab and I really didn't know the significance of the research going on at the Stroud Lab at that point. Even Ken's work at Michigan was a little more remote from Idaho State. So those two things, the AAAS contacts and Sedell: in this roundabout way through I.B.P. and eventually being asked to join the group in the deliberations, that eventually led to a proposal which we called the River Continuum Concept.

VR [8:16]: When you were doing the River Continuum research, was this the main focus of the activities of your lab room or were you doing other things as well?

WM: I think we all were probably doing other things. That's essential to keeping alive. And some you're carrying to completion as you're starting up others. And a few things you're trying to keep together as a hedge on the future as well. But the River Continuum became the focal effort and the other things were either put around that or constrained in some way by the efforts of the River Continuum. The I.B.P program was winding down, the funding there was drying up. So there was some completion of work there ... and some that sort of was left hanging. I had some work that had moved forward on the Mink Creek research which I hurried up and finished some of that to try to get it off to publication as quickly as I could. And then some other things that were kind of just put on hold as we began to become more fully immersed in the River Continuum research. Then after that first year or so of transition, it's almost like total immersion.

VR [9:31]: What I'd like to do is ask you about each of the participants in the Continuum in terms of what role they played and you think they brought to the project. And, of course, let me start by asking you about Robin Vannote.

WM: Right, and for each of these I won't do them justice because there's just so much to sort of fill in and the memory fades a bit, too. But each will have a high point, I suppose, in one's memory as to what they did. Robin was foremost among the idea people. He obviously originated the River Continuum Concept that we built the framework on and fleshed out. He had a strong geomorphological background and I learned my geomorphology from Robin that had a very important impact on my research and teaching into the future throughout the rest of my career as a result of that. Some real in-depth thinking and a far-reaching sort of view that was matched probably only by Jim Sedell. Jim came from a whole different angle. So for Robin I would attribute the real genius of generating ideas that were global in their importance. And by global I mean, as opposed to local, Far-reaching and over-arching.

VR [10:56]: How about Bert Cushing?

WM: Bert, as I've said several times during the interviews and so on, has just been a good long-lasting friend. Partly because we were close, partly because we sort of complemented each other's strengths. But Bert was sort of the steady base and he brought to us, I mean, he would just always volunteer and deliver whatever he was asked for, so he was just kind of, almost like thinking of an accountant, basically. Keeping us on task, bringing things together, and overall providing continuity and a friendliness among the PIs that was very very important. So in some aspects, he doesn't stand out as prominently as the others, but often it's that steady force that carries everything through the tough times, through the highs and lows, and that's what Bert really did provide.

VR [11:53]: How about Ken Cummings?

WM: Ken was another idea person and Ken's enthusiasm, his ideas, his "spark." That's really all [the group]...we've got several now, that we'll talk about, that this "sparking" is a really important thing. Getting you pumped up and sort of moving forward; somewhat

like cheerleaders and very important in that respect. Obviously, Ken brought the perspective of the functional feeding groups and he and I had been in parallel looking at detritus and its impacts. He had been able to move far ahead in terms of the experimental side of it and with the experimental streams they had and the research team he built up there. So he was making a number of advances that were really important in our thinking and in terms of research design and the like.

VR [12:48]: And, of course, Jim Sedell.

WM: Right. Well, Jim has taken a number of shots, but he is the spark that got things going, he's the one I think brought people together. He's sort of like a firefly in the spark he delivers. He's moving around, flitting around, but also having a very good big view, big picture view, of what was happening. He and Robin, I think, complemented each other in that regard. Robin had a much stronger geomorphological, entomological background, but Jim had the energy and the view of a need to sort of look much more broadly than I [had] and [than] I think many of us were accustomed to at the time. He brought the strength of an acquaintance, a strong acquaintance, with Jerry Franklin and of a really productive and innovative team operating at Oregon State University. Each of these, Robin's group, Ken's group, and Jim's group, each had a real depth in terms of the number of other people working with them; whether they were graduate students, whether they were technicians, whether they were other scientists. All that came to bear that when we began to move forward with the proposal and the research.

VR [14:04]: Wayne, what do you think your role was? This is a tough one to answer right. What do you think you provided?

WM: I'm not sure because I don't think about that a lot and I don't dwell on that. I know that I was a steady force. First of all, the projects were run through Idaho State, so I became sort of the lead PI in some ways in terms of keeping the paperwork together and some of the nitty gritty. But I also, maybe incurred (I felt a responsibility) to see that some of this stuff was carried to publication. Sometimes I was left with the burden of carrying some of that to publication; at times when distractions occupied some of the other PIs. So, I think I did allow, I was able to allow us to deliver on the product that most scientists would look at as proof of whether we used the money wisely, whether our ideas were worth evaluating or not. Other than that, I think I was able to maintain a good friendship and a rapport among all of the PIs at a time when sometimes there were conflicts between individuals. So, I would often be able to talk to one and then go talk to another and do a transition between the two in either an information transfer or even smoothing over ruffled feathers so that we could come together and move forward together. So, in a different sense than Bert, I think I was a steady force in, what I felt, keeping open the channels of communication and effectively allowing everyone to move on with what we were about in terms of doing the science.

VR [16:00]: Do you think that people outside of the group were aware of what roles you were playing, or do you think they viewed you as just sort of a homogenous group of everybody generating ideas and everybody doing all these roles?

WM: No, well, first of all, I think people by their personality sometimes become dominant or become lightning rods. So some people will be recognized among a group, rightly so or not, but they're just sort of, "Oh yeah, that person obviously must've had a lot of influence over the River Continuum." I think probably they did attribute some greater roles by some investigators rather than others. Again, whether that's correct or not, and I would say not as correct as they might think. But I don't think they saw us as "The Force" or "There's the Continuum group" or probably be able to pick us out of a crowd "There's this wedge of people that are obviously the Continuum group". And we didn't tend to just hang together exclusive of other people when we went to meetings and so on. But I'd be surprised if someone were to tell me, or you were to tell me, "Oh yeah, it's the four or five of you that everyone says when there's a continuum thing 'That's who I think of' ". And I wouldn't be the one that I would name as being the one that they would focus on; the one or two. I think it would be a couple people that we've already talked about.

VR [17:30]: Are there any directions that you would've liked to see the RCC go in that, for funding or other reasons, you just didn't get into it?

WM: Yeah, for me, again, I have a much better ability now to do global views and to see a broader picture and to look into the future as to where research ought to go. But at that time, I probably still was more intent on making it better science. So I would've been interested in: more replication, in a fuller representation of the annual sequencing of this whole; in filling in what the macroinvertebrate production and biomass responses were in relation to the continuum, as the effort where I would've liked to have seen it gone, at that point in time. In retrospect, we really would've had a great opportunity to look at much stronger linkages with the riparian. We know that's important, we knew it was important all along, but we had to sort of stay with the wetted perimeter, as our focus. We know the importance in the Salmon River that's very true of the hyporheic, and of upwellings and downwellings, and I think, in retrospect, I would've liked to fill that in. I would've liked to have tested the larger river ideas in other systems, other than the Salmon River and looked at things in that regard. And I think we could've done a much better thing by.... (because of financial and labor constraints, we were studying transects).... I think we could've done upstream downstream sorts of reach budgets much as Stewart Fisher pioneered on the Fort River and things of that sort. So, as you see, most of the things that I'm talking about are just sort of doing that little piece of research better rather than taking it in all new directions. And that's a good place to say....., that's where I would've been at that point. I certainly have gone different directions since then and I've found some interesting new areas to make contributions in.

VR [19:52]: There have been several spin-off of the River Continuum that, for example, the Serial Discontinuity Concept, that basically change the Continuum on a ?reset? and then new names were placed on a lot of the ideas. How did you feel about that?

WM: I felt both gratified that they were helpful in one way; gratified in that they saw the River Continuum as a useful model and that they could tailor it to adjust to certain

situations such as a dams and rivers system. And I think, overall, those have been very profitable contributions, so even my negative effects are somewhat dampened by that it has proved out that those have been useful conceptual images. In some ways, it's sort of like saying, "Gee, I thought we already said that." Obviously, we haven't filled it out as well, but the essence of these disconnects and so on, were in our thinking. It's, again, we were trying to set up, more or less, a null model (the pristine environment) against which, when you got a deviation, you could say, "Yeah this is a deviation, because of the disconnect, the discontinuity, of this set up by the dam or change in retention that might exist." So, in a way, those are simply embellishments and refinements of an overall model. I think the same thing could be said against the Flood Plain kinds of ideas of the rolled flood plains and the ladder effect. That certainly has been an embellishment, developed as a very profitable way of looking at larger systems. But it's not something we hadn't considered. It's not only implicit, it's explicit in the original River Continuum paper, but it also was in an area that we couldn't test and we had no familiarity beyond a cursory familiarity with something like the Amazon. And one where again, it just seems to me to just dot some i's and cross some t's in the overall continuum rather than change that. But it's part of marketing, part of selling an article or research grant, to put new names on these. So whether you call it Serial Discontinuity or Hyporheic or RiparianCorridor kinds of concept or whatever, those are really simply sort of corollary to the River Continuum in my mind. Again, without wanting to lay claim to all of it, I think all of those have been very valuable expansions on those original ideas. Just as the spiraling concept was a very valuable contribution.

VR [22:57]: Have you been pleased the way the ideas in the River Continuum have been used in management? Do you think they've taken them as far as they could?

WM: In some contexts, you wonder if they've taken them at all, in terms of applying what we've found. There are several things that I can think of. I think the initial work and then the later work that the Oregon group did on the role of woody debris is a very important change in our way of looking at streams and the importance of habitat structure in streams. I think a lot of people now realize what they do in the headwaters will have impacts a long way down, but whether they then manage middle size rivers or larger size rivers with that in their minds, often makes me wonder if they're taking to heart what we've taught. And there's a whole lot of arguing now between "Headwater streams are underappreciated" and "Headwater streams are where the action is" and so just count them up and headwater streams are where the action is, but underappreciated? The problem at our time was we all came from headwater kind of studies and nobody had ever gotten beyond that. Nobody had extended made implications down the river system and so on. So I think maybe that realization is more appreciated now among managers and among stream ecologists, but we seem to have almost gone full circle, we're reverting now to "Headwaters, gee, we've got to put all emphasis there." I think a better balance would be appropriate. Beyond that, it's hard for me to judge just how widely. Mainly in part because that's not the literature and not the direction that my interests, which have been basic ecology, has really gone. Other than that, maybe one other issue is just "processing, that goes on in streams. And how much loading from sewage and from

nutrients and so on a system can take and how you can tweak it. I think there's a lot to be learned from the River Continuum in terms of those interpretations.

VR [25:23]: Wayne, you've had a great forty year career and there are few scientists that can match what you've done. What do you think your biggest contributions, that you're leaving for the next generation of scientists, have been?

WM: My biggest contribution and my biggest joy, I think, has been the work with graduate students. To me, that's one of the most fulfilling experiences in my life and the greatest opportunity: to work with such a variety of people, to see people's eyes light up, to see them sort of come alive, and take hold in the growth that they undergo in the process. That's really been a "mainstay" in my career and I take great pride in it, I take pride in the fact that I've had over fifty successful graduates and very few ultimate failures in terms of their role. So that's my legacy to the future, I think, it's what's in my graduate students and so on, and where I count most of my productivity. In spite of over one hundred publications and so on, that's kind of just . . . , that's the result of the effort put out and that, in most cases, we put out. If you'll look at my publication list, it almost . . . , there are very few single-author publications in my list. It's because of the interactive role that I appreciated and cherished, both with other investigators and with my other students.

VR: Thank you very much.